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Lev A. Nessov

# Late Mesozoic amphibians and lizards of Soviet Middle Asia

[With plates XIII—XVII and 2 text—figs]

**Późnomezozoiczne płazy i jaszczurki radzieckiej Azji środkowej**

Abstract. Compositions of assemblages of amphibians and lizards of the Bathonian, Callovian, Kimmeridgian, Late Albian, Early Cenomanian, Cenomanian, Cenomanian-? Early Turonian, Late Turonian, Coniacian, Santonian, Santonian-?Campanian of Soviet Middle Asia are described. Bones of Maestrichtian mosasaurs are noted. Presumably the latest known labyrinthodont amphibian remains and bones of ancient salamanders have been found in the Bathonian and Callovian.

## I. INTRODUCTION

In 1975—1985 the author and his students using dry and underwater screening, environment reconstructions and biocenology predictions found in Soviet Middle Asia (Fig. 1) many thousand of bones and teeth of rare Cretaceous vertebrates: amphibians, lizards, pterosaurs, birds and mammals (Nessov, 1980, 1981a, 1981c, 1984b, 1985a, 1985b, 1985c, 1985d, 1986a). A number of new rich assemblages with rare vertebrate fossils of Jurassic and Paleogene ages are now also being studied (Nessov and Kaznyshkin, 1985; Nessov and Udovitshenko, 1986). Most of these assemblages of fossils were formed near the shores in the shallow parts of eutrophic calm brackish gulfs neighbouring with afforested coastal plains (Nessov, 1980, 1984a, 1984b). The Late Albian reservoir of Karakalpakia inhabited by vertebrates was the only one Asiatic in the study to have approximately normal marine salinity. The climate of mentioned coastal plains was usually semihumid with tendency to aridization in the Callovian-Kimmeridgian and Santonian-Campanian. Remains of amphibians and lizards in the Bathonian, Callovian and Cretaceous assemblages are rare. Quantitative characteristics of oryctocomplexes see in Nessov and Golovneva (1983).

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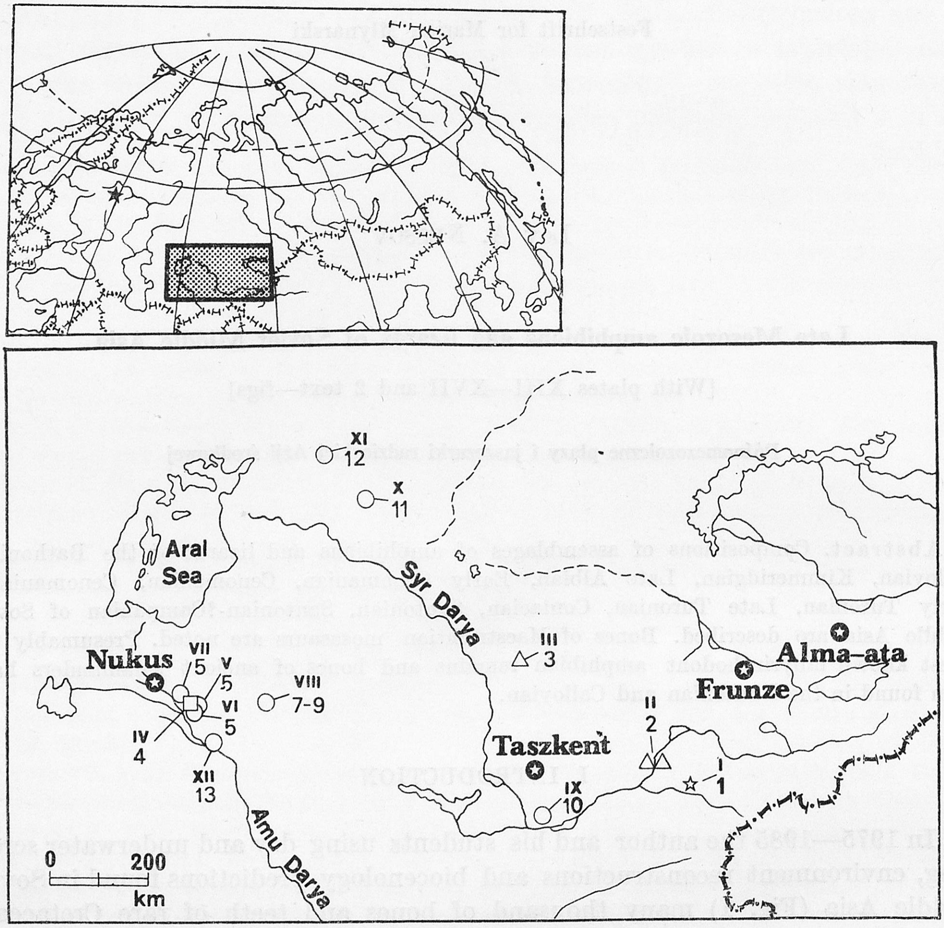



Fig. 1. Map of the part of Soviet Middle Asia (area of south-western borderlands of ancient Asia in the Late Jurassic and Cretaceous) showing the Late Mesozoic amphibian and lizard localities. Asterisk — Middle Jurassic, triangles — Jurassic, squares — Early Cretaceous, circles — Late Cretaceous. Arabic numerals indicate the type of assemblage (see text). Roman numerals indicate the localities: I — Kizylsu and Kugart, II — Tashkumyr, III Michailovka, IV — Chodzhakul Lake, V — Chodzhakulsay, VI — Sheichdzheili, VII — Tçelpyk, VIII — Dzharakhuduk, IX — Kansai, X — Shach-Shach, XI — Baybishe, XII — Meshekli

## II. SERIES OF LATE MESOZOIC AMPHIBIAN AND LIZARD ASSEMBLAGES OF SOVIET MIDDLE ASIA

1. Bathonian (Middle Jurassic). Red and black shales. Kizylsu and Kugart localities, north-eastern part of Ferghana Valley, Kirghizia. About 20 bones of middle-sized salamanders (*Kokartus honorarius* gen. sp. n. of family *Karauridae*: see Description added in the proof). One bone possibly of labyrinthodont.

2. Callovian (Upper Jurassic according to the type of climate and to the Code of Stratigraphy of the USSR), Balabansay Formation (thickness — 83—119 m), Tashkumyr locality (Sarykamyshsay, Uurusay and Dzhidasay valleys), Northern Ferghana, Kirghizia. In the lower part of the formation there are remains of the presumably latest labyrinthodont amphibian, probably belonging to the *Capitosauroidea* branch (NESSOV, 1986b; pl. XIII: 1—11), middle-sized frontal bone of deviated lepospondyl amphibian *Albanerpetontidae* (*Allocaudata* lineage), procoelous vertebrae of small lizards and amphicoelous vertebra of salamander (length of body 7 mm, diameter 5.2 mm), found in the upper part of the formation (NESSOV, 1985a). The age of the remnants was determined by the position of the fossils over layers with rich Lower and Middle Jurassic plant fossils and according to the palinological (ALIEV et al., 1981) and malacological (VERZILIN et al., 1970) investigations.

3. Kimmeridgian (Upper Jurassic), Karabastau Formation, Michailovka locality, Karatau Ridge, Southern Kazakhstan. Complete skeleton of salamander *Karaurus sharovi* IVACHNENKO (*Karauridae*) (IVACHNENKO, 1978) and lizard *Sharovisaurus karatauensis* HECHT et HECHT (*Paramacellodidae*) (HECHT and HECHT, 1984). The age of fossils was determined mainly on the degree of biological advance of various vertebrates and insects.

4. Upper Albian (Late Cretaceous), lower or middle part of the Chodzhakul Formation, cliffs near the dried up Chodzhakul Lake, Sultanuvais Ridge (= Sultanuizdag Mountains), Karakalpakia. Salamanders *Horezmia gracile* NESSOV (*Eoscapherpetontinae*, *Scapherpetontidae*) (NESSOV, 1981c; NESSOV and UDOVITCHENKO, 1986) (pl. XIII: 12—18), anurans ?*Discoglossidae* and ?*Pelobatidae* (urostyles with single and double anterior condyles, smooth and tuberculated skull roof bones). Small- and middle-sized lizards *Oxia karakalpakensis* NESSOV, *Hodzhakulia magna* NESSOV (*Lacertilia* incertae sedis) (NESSOV, 1985c), small-sized ones of new genera (NESSOV, 1981c) (pl. XVII: 2—4) and cf. *Simoliopheidae* (pl. XVII: 6). The age (SCHULTZ, 1972: Fig. 8; NESSOV, 1981c) was emended (NESSOV, 1985d; NESSOV and MERTIHIENE, 1986) on the grounds of finding the teeth of sharks *Paraisurus* and mammals of the *Pappotheriidae* (NESSOV, 1985b).

5. Lower Cenomanian (Upper Cretaceous), upper part of the Chodzhakul Formation (approximately 14 m above the layer 4), Sheichdzheili, Chodzhakulsay and other localities, Sultanuvais Ridge, Karakalpakia. Salamanders *Horezmia gracile* NESSOV (? new subspecies) and lepospondyl amphibian *Nukusurus insuetus* NESSOV (*Albanerpetontidae*). Frogs ?*Discoglossidae* and ?*Pelobatidae*. Various small lizards (pl. XVII: 8—11), relatively large saurian (pl. XVII: 12). Cf. *Simoliopheidae*. The age was determined on the basis of pelecypod remains (SCHULTZ, 1972), on evolutionary advance of sharks (*Anacoracidae*), crocodiles, hadrosaurs and also according to the absence of the *Ptychodontidae* and true *Scapanorhynchus* sharks which are known to appear in the Late Cenomianian only.

6. Cenomianian — ?Lower Turonian (Upper Cretaceous), upper part

of the Chodzhakul Formation or lower beds of the Beshtube Formation (SCHULTZ, 1972: Fig. 8), Tçelpyk Hill, Karakalpakia. Salamanders *Horezmia gracile* NESSOV (the same subspecies as in assemblage 5?), lepospondyl *Nukusurus insuetus* NESSOV (NESSOV, 1981c) (pl. XIV: 33). Frogs and lizards.

7. Upper Turonian, lower part of the Taikarshin Beds (thickness about 103 m), Dzharakhuduk locality, central part of Kizylkum Desert, Uzbekistan. Salamanders *Eoscapherpeton asiaticum* NESSOV (*Eoscapherpetontinae*, *Scapherpetontidae*) (NESSOV, 1981c) (pl. XV: 19, 24, 26; pl. XVI: 9, 10) and small form without hypapophysis on atlas. Frogs *Itemirella cretacea* NESSOV, *Kizylkuma antiqua* NESSOV and *Aralobatrachus robustus* NESSOV (fam. indet.) (NESSOV, 1981c). The two latter species were ascribed to the *Pelobatidae* (DUELLMAN and TRUEB, 1986), but the systematic position of these poorly known forms is not quite certain yet. Various small lizards. The age of the assemblage was determined on the basis of the teeth of sharks *Palaeoanacorax* (*Anacoracidae*) by R. A. MERTINIENE and L. S. GLICKMAN.

8. Coniacian, middle part of Taikarshin Beds, Dzharakhuduk. Salamanders *Eoscapherpeton asiaticum* NESSOV (NESSOV, 1981c; NESSOV and UDOVITSHENKO, 1986) (pl. XV: 1, 2, 4—18, 20—23, 25—27; pl. XVI: 1—4), relatively large *Eoscapherpeton* sp. with the length of vertebrae up to 8.5 mm (pl. XV: 3; pl. XVI: 7), small *Mynbulakia surgayi* NESSOV (*Batrachosauroididae*) (NESSOV, 1981c) (pl. XIV: 21—23). There are remnants of various new forms of salamanders (pl. XIV: 24—30), some of which (pl. XIV: 24, 25) were previously erroneously ascribed to *Bissektia* (NESSOV and UDOVITSHENKO, 1986). The latter genus (see below) is transferred here to *Anura* incertae sedis. The assemblage includes also new form of albanerpetontid (pl. XIV: 31), frogs *Eopelobates sosedkoi* NESSOV (*Pelobatidae*) (NESSOV, 1981c; NESSOV and UDOVITSHENKO, 1986) (pl. XIV: 1—7), *Kizylkuma antiqua* NESSOV, *Bissektia nana* NESSOV (fam. indet.) (NESSOV, 1981c) (pl. XIV: 9, 10), large flog with flattened shaft of the cruris. Pelobatid skull roof bones dominate among Coniacian skull remnants of frogs, but all, more than 35 Coniacian urostyls from Dzharakhuduk have double horizontally stretched joint surfaces. One urostyle has two round cotyls; there are also two urostyls with almost undivided front cotyle (one of them having transverse processes and the other without processes). Apparently the Coniacian pelobatids of Kizylkum region had discoglossid-like urostyl bones (see also ESTES and SANCHÍZ, 1982). Lizards *Buckantaus crassidens* NESSOV (?*Teiidae*) (NESSOV, 1985c), *Ekshmer bissektensis* NESSOV (*Necrosauridae*) (NESSOV, 1981b), small necrosaurid, cf. *Varanidae*, new *Paragaminae* (*Agamidae*) (pl. XVII: 14) and various other species (for example, pl. XVII: 13, 15—17). The age was determined by combined findings of the teeth of sharks *Praceptychocorax* ex gr. *curvatus* (WILL.) and *Ptychocorax aulaticus* GLÜCK. et IST. (determination by R. A. MERTINIENE, L. S. GLICKMAN and the author).

9. ?Coniacian, upper part of Taikarshin Beds, Dzharakhuduk. Salamanders *Eoscapherpeton asiaticum* NESSOV. Frogs and lizards. Besides the typical for the Taikarshin Beds teeth of rays *Myledaphus tritus* NESSOV (NESSOV and

UDOVITSHENKO, 1986) there are rare teeth of *Parapalaeobates* here. The latter ray genus is characteristic for assemblages 9 and 10 (where *Myledaphus* is absent).

10. Lower Santonian, upper part of Jalovatsh Formation, Kansay (near Kizylkhuduk village), Western Ferghana, Tadjikistan. Salamanders *Eoscapherpeton* sp. B (anterior edge of atlas hypapophysis is nearly vertical). Frogs *Eopelobates* sp. (NESSOV, 1985a), small teiid-like lizards. The age was determined upon the findings of brackish water molluscs (studied by G. G. MARTINSON) and by the absence of typical Coniacian forms of vertebrates.

11. Santonian, lower part of Bostobe Formation, Shach-Shach locality (near Zhalmauz Well), north-eastern part of the by-Aral-Sea region, Kazakhstan. Salamanders *Eoscapherpetontinae*. Lizards. The age was determined on the basis of comparison of various vertebrate fossils (other than lizards and amphibians) with rich assemblage 7—9, 11.

12. Santonian—?Campanian, middle or upper part of Bostobe Formation (32 m above Baybishe Wells), Baybishe, north-eastern part of the by-Aral-Sea region, Kazakhstan. Salamanders *Eoscapherpeton* sp. B (?) and presumably prosirenid (NESSOV and UDOVITSHENKO, 1986) (pl. XVI: 11, 12). The age was determined by P. V. SHILIN basing on plant fossils and by the author regarding the remains of younger fishes and reptiles, that are not distinguished in the assemblages 9 and 10.

13. Upper Maestrichtian, Meshekli, south-eastern part of Karakalpakia. Giant marine lizards *Mosasauridae* (KOVALEVA et al., 1982). The age was determined on the basis of brachiopods, pelecypods and belemnites. Perhaps mosasaur vertebrae were found in this region earlier (MASSON, 1934). Mosasaur remains are known also from the Senonian of the northern part of Kazakhstan: in the Ajat River Basin (NOVOCHATSKY, 1954), near Kushmurun settlement of Kustanay region and also in Aktjubinsk region (JAKOVLEV, 1905).

## III. DISCUSSION

Labyrinthodont amphibians were known from the Late Devonian in Greenland, Australia and the USSR (LEBEDEV, 1984) to the Early Jurassic in Australia (LONGMAN, 1941; WARREN and HUTCHISON, 1982). Recently remains of Middle Jurassic labyrinthodonts (*Brachiopidae* and undetermined bones) have been mentioned from two regions of China (BUFFETAUT and TONG, 1986).* The Late Jurassic (Callovian) presence of the group was established for the USSR (NESSOV, 1986b). Vertebrae of *Cyrtura* (see KUHN, 1964) from the Upper Jurassic (Tithonian) of the German Federal Republic had small hypocentra and large pleurocentra which show that this animal was not temnospondyl

* A bone of a Middle or Upper Jurassic labyrinthodont amphibian has been recently found in the material from Shar-Teg, Mongolia (pers. obs.).

amphibian (WARREN and HUTCHISON, 1982). Labyrinthodonts of Kirghizia have some affinities, as it seems, to *Capitosauroidea*, for instance, to the *Mastodonsauridae* and *Cyclotosauridae*.

Besides the labyrinthodonts, Callovian assemblage had other relict vertebrates of the Paleozoic and Triassic "appearance": two species of archaic sharks *Polyacrodus*, new species of polyacrodontid *Palaeobates* with ray-like teeth, dipnoan *Ferganoceratodus* (NESSOV and KAZNYSHKIN, 1985), large paleoniscoid fishes with some teeth resemblance to *Birgeria* and *Colobodus*. Genus *Palaeobates* was previously known for the Triassic only (SCHULTZE and MÖLLER, 1986). It is known, that abiotic conditions in estuaries and brackish gulfs (salinity, temperature and so on) are characterized by severity and considerable inconstancy). Only a few organisms are capable to live here. Therefore the pressure of competitors in estuaries is comparatively weak and biotic conditions are favourable for protracted preservation of some relict organisms in the Mesozoic as well as Caenozoic. The Callovian assemblage of Ferghana besides relicts had also "block" of advanced vertebrates — metachelydian turtles (NESSOV, 1984a, 1985d) and metamesosuchian crocodiles resembling the Late Cretaceous *Paralligatoridae*.

The lower jaw of eoscapherpetontines (*Horezmia* and *Eoscapherpeton*), as in the *Hynobiidae* and *Cryptobranchidae* (EDWARDS, 1976) consists of 3 bones: angular, gonial and dentary (LEBEDKINA, 1979). The gonial of *Horezmia* has a sharp prominent oblique ridge on the medial side (pl. XIII: 12, 13). The same ridge in *Eoscapherpeton* (pl. XV: 15, 16) is swollen and less prominent. The premaxilla of eoscapherpetontines is small. The upper process of this bone (pl. XV: 7, 8) is narrow, short and lies close to medial line of the skull. The large maxilla in both genera has prominent, down oriented ridge on outer face of the bone (pl. XV: 13). The pars facialis of this bone is not reduced. The small opening for the arteria carotica interna lies near the lateral edge of the parasphenoid in *Eoscapherpeton* (pl. XV: 20—22). The upper side of the parasphenoid of *Eoscapherpeton*, as in labyrinthodonts (see SHISHKIN, 1973: Fig. 59) has a weak medial groove-like pit (sella turcica?). There are openings on either side of this pit (and somewhat backwards) regarded here as orifices of branches of arteria palatina. The usual pair of small openings possibly for the cerebral branch is somewhat visible on the bottom of a medial groove-like pit. Near each border of the upper side of the parasphenoid there is a pair of openings presumably for the palatine nerve. The prootic and exoccipital ossifications of eoscapherpetontines (pl. XIII: 15; pl. XVI: 1—3) are separate. Both genera are characterized by prominent occipital condyles which permit the large amplitude of the vertical movement of the head. The opening for the IX and X head nerves in both eoscapherpetontine genera is usually vertically stretched. Supposedly hemicircular canals of *Horezmia* are somewhat more included in bone than those of *Eoscapherpeton*. The preoperculo-squamosals (pl. XIII: 16, 19, 20; pl. XV: 10, 11) and quadrates (pl. XV: 9) in both genera are robust, with pocket-like long common sutures. The scapulocoracoid (pl. XV: 12) has two

openings. The femur (pl. XV: 19) has a very strong, prominent and long trochanter ridge. The hypapophysis of the atlas in *Horezmia* (pl. XIII: 17) in comparison with *Eoscapherpeton* (pl. XV: 1—4) has more considerable inclination backwards and is shorter in size. Anterior cotyles of the atlas in *Horezmia* are circular (pl. XIII: 17a), but in *Eoscapherpeton* (pl. XV: 1a, 2, 3; pl. XVI: 11) the cotyles are vertically stretched.

Asiatic scapherpetontids are less paedomorphic than American members of the family (see ESTES, 1981). The Late Albian scapherpetontids lived in small ponds separated from the salt water gulf by coastal bank. Adult Late Cretaceous eoscapherpetontines died in brackish reservoirs near the shores, mainly in river-like channels connecting brackish lakes and estuaries. The prominent occipital condyles with extreme movable joint and presence of hypapophyses of the atlas in Asiatic scapherpetontids have an analogue in desmognathine plethodontids which have ties of specialized temporal musculature with strong tendon to the first vertebra (HINDERSTEIN, 1971). The mentioned structures and heavy gonial, quadrate, preoperculo-squamosal and robust atlas suggest that essential part of temporal musculature of eoscapherpetontines was used for the strong upward movement of the head during the burrowing. The animals could hide themselves in the coastal thickets of presumably aquatic angiosperms (tiny fossilized roots and shoots are very usual in outcrops), in the soft soil of shores or among fallen leaves and branches of platan forests (NESSOV, 1980: Fig. 1) situated on the shores. Robust extremities and external ridge of the maxilla correspond to this mode of life. A high tail of eoscapherpetontines suggests a good ability of swimming.

*Horezmia* and, especially, *Eoscapherpeton* are unique among *Caudata* and *Gymnophiona* (see TAYLOR, 1977) in the extremely advanced development of atlas hypapophyses. American scapherpetontids had either only rudimentary hypapophysis on the atlas (e. g. some *Lisserpeton*) or did not have it at all. Taking all the circumstances into consideration we can assume that a common ancestor of known Asiatic and American scapherpetontids lived in the coastal plains of presumably South or South-eastern Asia before the Late Albian. The level of organization of eoscapherpetontines was close to that of *Dicamptodontidae* or somewhat lower, but Asiatic salamanders belong to another branch.

Batrachosauroid genus *Mynbulakia* (NESSOV, 1981c) (pl. XIV: 21—23) is monotypical now. This salamander had also subhorizontal ridge on the external side of the maxilla (pl. XIV: 21), similar to those of eoscapherpetontines. The atlas of *Mynbulakia* have circular cotyles, hypapophyses are absent.

The frontoparietals in frogs *Eopelabates sosedkoi* NESSOV (NESSOV, 1981c) (pl. XIV: 1—7) are separated by a medial suture. The canals for vessels within frontoparietal (pl. XIV: 1a) are as in *Pelobates* (see ROČEK, 1981). Unpaired ossification in the hind part of skull roof of *Pelobates* was homologized by ROČEK in his important work (1981) with extrascapular medial bone of some crossopterygian fishes. It is more probable that the presence of unpaired element in the hind part of the skull roof of *Pelobates* (which is absent in primitive

pelobatid *Eopelobates*) is advanced condition. Perhaps differences in skull roof of *Eopelobates* and *Pelobates* were the result of the rebuilding of morphogensis. Unpaired ossification (Roček, 1981: Fig. 43) might develop by transverse fusion of early embrional paired parietals (see Lebedkina, 1979: Fig. 84) or it could represent a quite new element. It is possible that this unpaired ossification served as a mechanical link between two large parts of skull roof. Remnants of Cretaceous anurans of Soviet Middle Asia show that pelobatid stock might originate from anurans of discoglossid-like level of organization before the Coniacian.

Lizards were more diverse than amphibians in the Cretaceous coastal plains of Soviet Middle Asia. Some evidence of this fact is given in descriptions (Nessov, 1981a, 1981b, 1985c) and photographs (pl. XVII). The majority of Cretaceous lizards of ancient Western Asia were of small sizes. The lizards with total length of body over 30—40 cm are recorded here only for the Late Albian and Early Cenomanian. It is interesting that in Mongolia there was a relatively great number of large lizards in Campanian-Maestrichtian faunas. There, especially in the Campanian, those lizards were widely dispersed near brackish lakes and gulfs, long enough in the Late Cretaceous time connected with the epicontinental seas. The main turnover of vertebrate coastal plain and estuary assemblage of Western and Central Asia of the Aptian-Campanian time was not from the Albian to Cenomanian, but from the Early to Late Turonian, after large regression of the sea.

In the last 10 years persistent search of Cretaceous snake bones in various localities of Soviet Middle Asia did not bring any positive results. Snakes having arisen in New World (Rage, 1982) in the Albian-Coniacian did not penetrate into the coastal plains of western part of ancient Asia or were very extremely rare here.

Holotypes of *Eoscapherpeton asiaticum*, *Mynbulakia surgayi* and *Eopelobates sosedkoi*, *Itmirella cretacea*, *Kizylkuma antiqua*, *Aralobatrachus robustus* are housed in the Zoological Institute, Academy of Sciences of the USSR, Leningrad; other remains of amphibians and all bones of lizards are in the Central Museum of Geological Exploration, Leningrad.

Department of Vertebrate Zoology
Faculty of Biology and Soils
Leningrad University
Leningrad, 199034, USSR

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**Description added in the proof:**

Order *Caudata* OPPEL, 1811
Suborder *Karauroidea* ESTES, 1981
Family *Karauridae* IVACHNENKO, 1978
*Kokartus* gen. n.

Type species (by monotypy). — *Kokartus honorarius* sp. n.

Type locality. — Kizylsu River (near Niczke Spring) in Kugart Basin, 100 km ESE from Tashkumyr, Kirghizia (see Fig. 1).

Type horizon. — Middle Jurassic, Bathonian, black and red shales.

Name derivation. — From Kugart (= Kökart) River.
Diagnosis. — As for the type species.

*Kokartus honorarius* sp. n.

Holotype. — A frontal, Central Museum of Geological Exploration (CMGE), Leningrad, No. 1/11998 (Fig. 2:1).
Referred material. — A praeoperculo-squamosum, a parasphenoid, an atlas, a femur, trunk vertebrae from Kizylsu and Kugart (Fig. 2:2-5).
Type locality and type horizon. — As for the genus.
Name derivation. — From Latin *honorarius*: named in honour.
Diagnosis. — A karaurid salamander differing from *Karaurus* by more straight ridge on the upper side of lateral process of praeoperculo-squamosum, by longer and narrower postero-lateral process of frontal, by narrower parasphenoid and femora.

Description. Skull roof bones have bulges with roughly tuberculated and ridged relief. Teeth sharp, curved inside, non-pediculate, with bulbous bases. Atlas high, with round interior cotyles; tuberculum interglenoideum prominent, forming a transverse blade hanging over the vertical area, possibly in contact with the skull base. Trunk vertebrae without hypapophyses, often having a pair of lateral pits on centra. Trochanter ridge reaches the middle of femur.

Measurements. The largest trunk vertebra centrum is 9.3 mm long; the length of parasphenoid is 25.6 mm. *Kokartus* resembled *Karaurus* (about 20 cm) in its size or was somewhat larger.

Remarks. The new salamander, the oldest known member of typical (non-albanerpetontid) *Caudata* lived near swamp shores of calm brackish reservoirs containing $H_2S$ in the depth. The assemblage included also large ptycholepidid palaeoniscoid fishes, thick-scaled holosteans, conchostracs, ostracods, insects and plants.

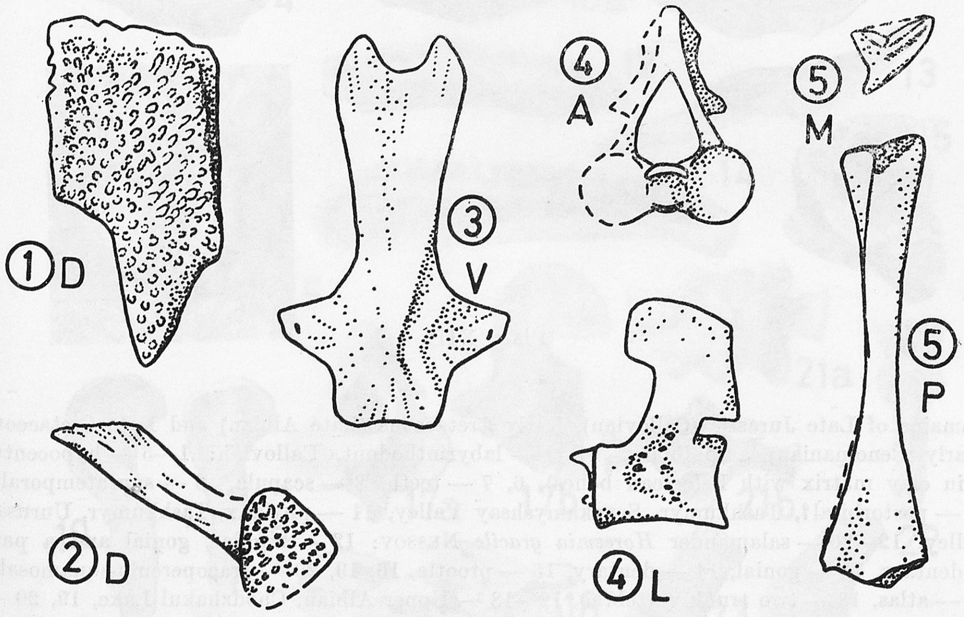



Fig. 2. *Kokartus honorarius* gen. sp. n. from Kizylsu (1-3,5) and Kugart (4), Kirghizia. 1 — frontal (holotype, CMGE 1/11998), 2 — praeoperculo-squamosum (CMGE 2/11998), 3 — parasphenoid (CMGE 3/11998), 4 — atlas (CMGE 4/11998), 5 — femur (CMGE 5/11998). A — anterior, D — dorsal, L — lateral, M — medial, P — posterior, *V* — ventral views. Magnifications: 2-4 — x2; 1,5 — x3

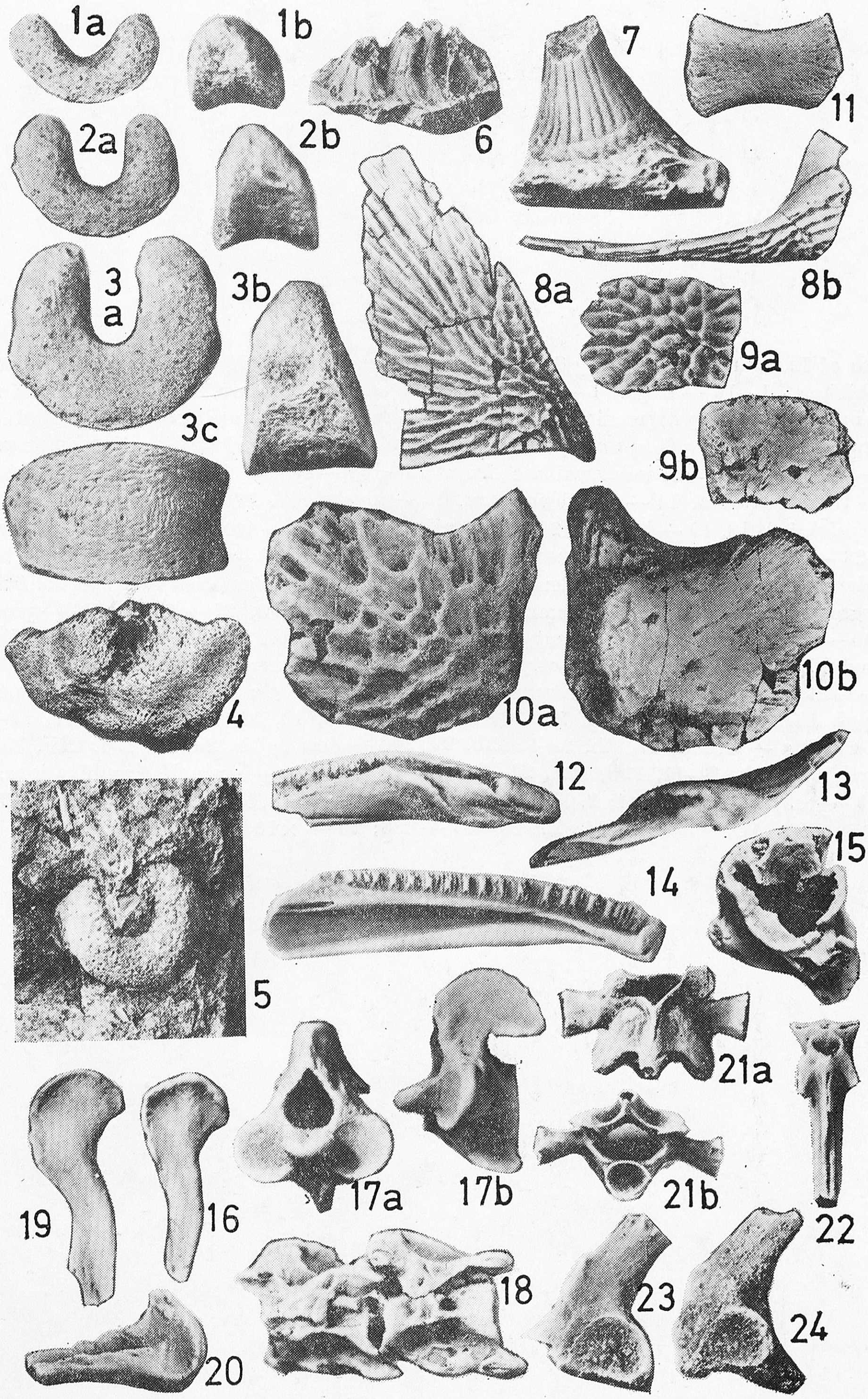
STRESZCZENIE

Praca przedstawia skład zespołów płazów i jaszczurek pochodzących z następujących późnomezozoicznych pięter Radzieckiej Azji Środkowej: baton, kelowej, kimeryd, wczesny cenoman, cenoman, cenoman-?wczesny turon, późny turon, koniak, santon, santon-?kampan. Wzmiankowano również o obecności mozazaurów w mastrychcie. Prawdopodobnie najmłodsze znane szczątki labiryntodontów i kości bardzo pierwotnych płazów ogoniastych pochodzą z batonu i keloweju.

Edited by Dr. Z. Szyndlar

Plate XIII

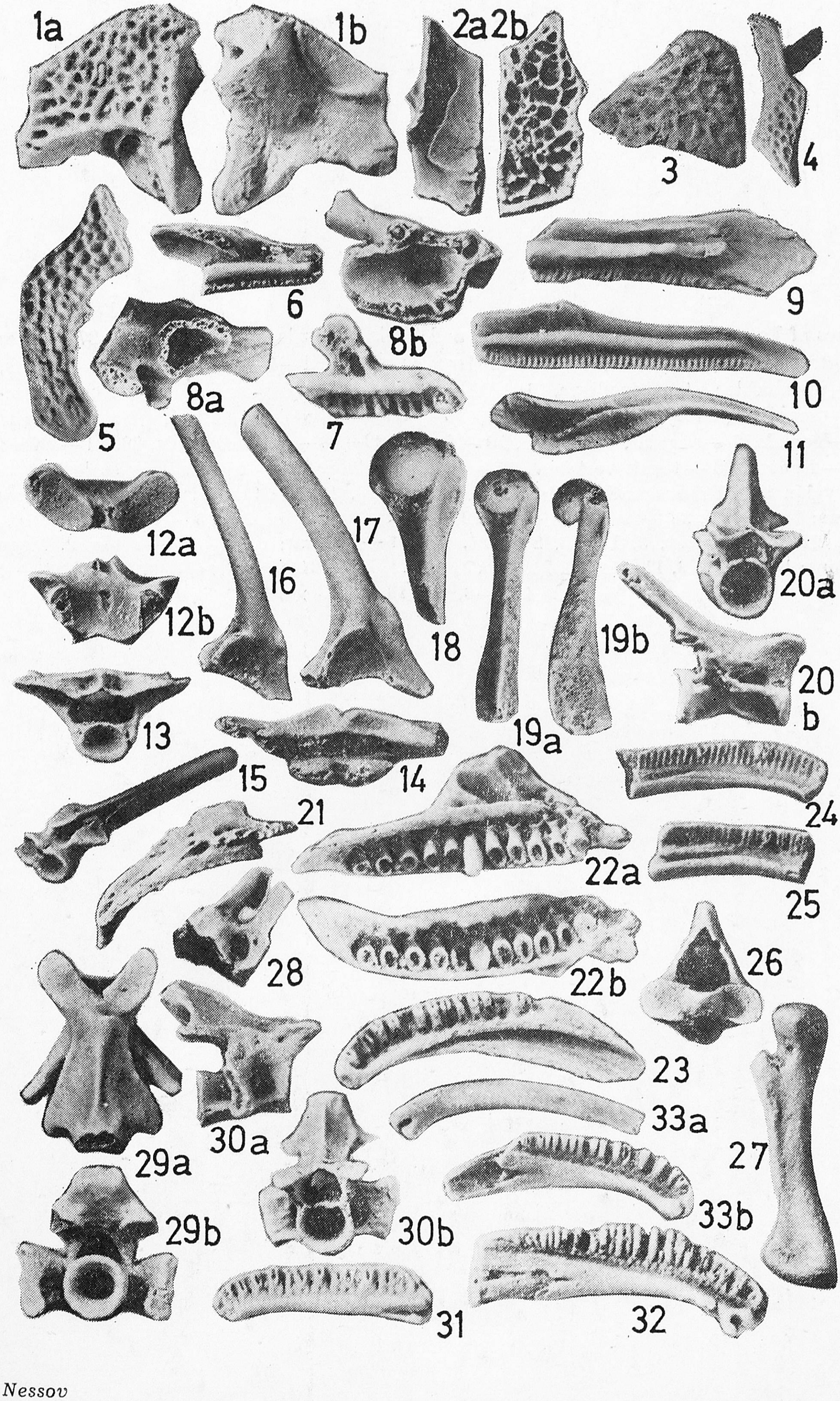
Remains of Late Jurassic (Callovian), Early Cretaceous (Late Albian) and Late Cretaceous (Early Cenomanian) amphibians. 1—11 — labyrinthodont, Callovian: 1—5 — hypocentra (5-in clay matrix with holostean bones), 6, 7 — teeth, 8 — scapula, 9 — supratemporal?, 10 — postorbital?, Tashkumyr, Sarykamyshsay Valley, 11 — phalanx, Tashkumyr, Uurusay Valley. 12—20 — salamander *Horezmia gracile* Nessov: 12 — angular, gonial and a part of dentary, 13 — gonial, 14 — dentary, 15 — prootic, 16, 19, 20 — praeoperculo-squamosals, 17 — atlas, 18 — two trunk vertebrae, 12—18 — Upper Albian, Chodzhakul Lake, 19, 20 — Lower Senomanian, Sheichdzheili. 21—24 — anurans: 21 — trunk vertebra, 22 — urostyl, 23, 24 — ilia. Views: 1a, 2a, 3a, ?4, 5, 17a — anterior; 15, 21b — posterior; 1b, 2b, 3b, 6, 7, 8b, 17b, 18, 23, 24 — lateral; 12, 14 — internal; 9a, 10a, 13, 16, 19, 21a, 22 — dorsal; 3c, 8a, 9b, 10b, 20, — ventral. Magnifications: 10 — ×1; 4, 8, 9, 11 — ×1.5; 5 — ×2; 1—3 — ×3; 12, 16—18 — ×4; 6, 7, 13—15, 20, 22 — ×5; 19, 21, 23, 24 — ×6


1a
1b
2a
2b
6
7
11
3
a
3b
3c
8a
8b
9a
9b
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10a
10b
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17b
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L. Nessov

## Plate XIV

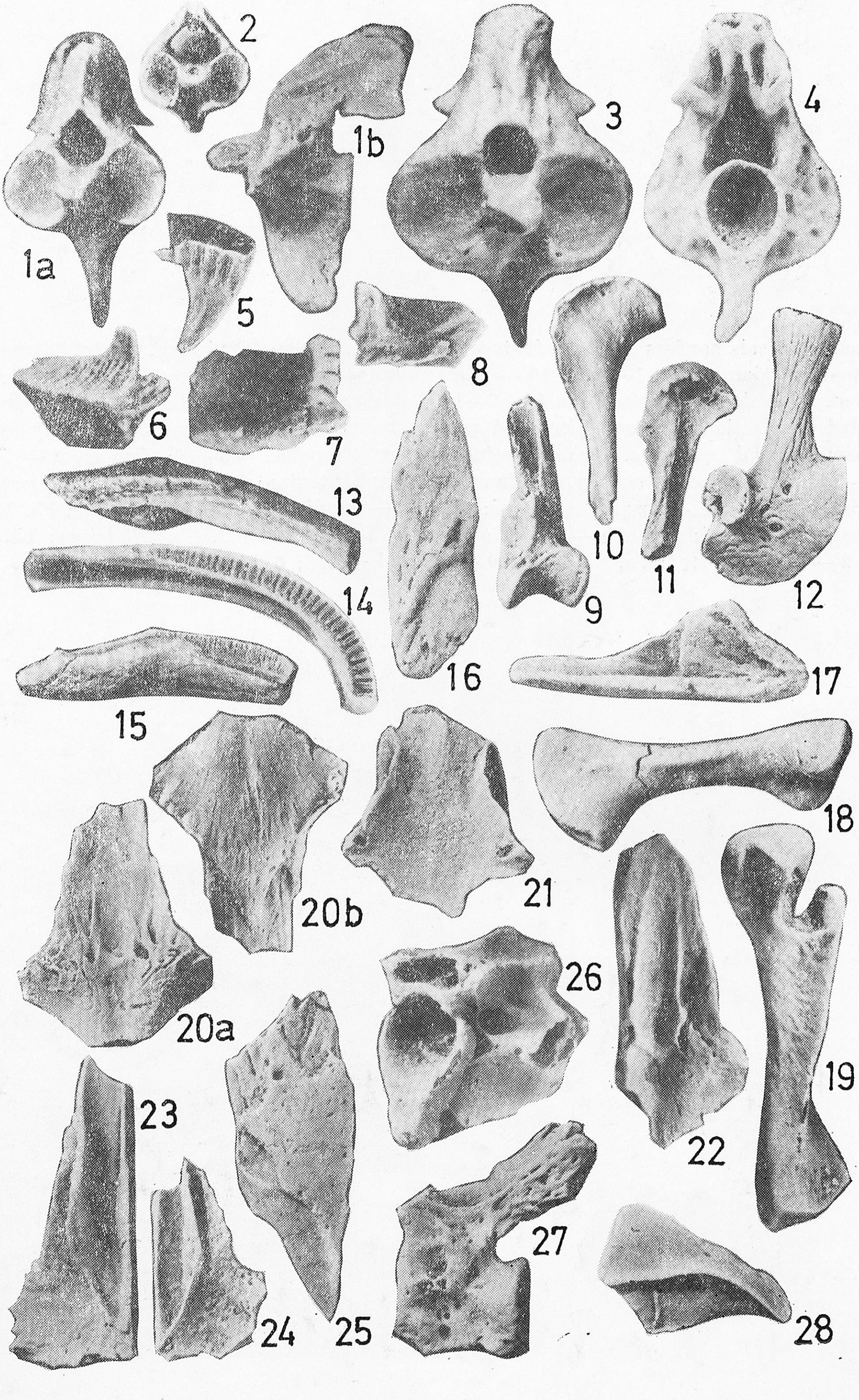
Bones of Late Cretaceous (Early Senomanian, Senomanian—?Early Turonian and Coniacian) amphibians. 1—19 — frogs: 1—7 — *Eopelobates sosedkoi* NESSOV, 1, 2 — frontoparietals, 3 — nasal, 4, 5 — preoperculo-squamosals, 6 — maxilla, 7 — premaxilla, 8 — hind part of braincase; 9 — *Kizylkuma antiqua* NESSOV, maxilla; 10 — *Bissektia nana* NESSOV, maxilla; 11 — angulosplenial of indeterminate frog; 12—15 — archaic *Eopelobatinae*: 12 — atlas, 13 — trunk vertebra, 14 — sacral vertebra, 15 — urostyl, 16, 17 — ilia (15—17 — possibly of *Eopelobates*), 18, 19 — humera. 20—30 — salamanders: 20 — trunk vertebra (?new genus); 21—23 — *Mynbulakia surgayi* NESSOV: 21, 22 — maxillae, 23 — dentary; 24—30 — bones of salamanders, some of which belong to new genera: 24, 25 — dentaries with specific Meckelian groove, 26 — atlas with laterally expanded front cotyles, 27 — femur, 28 — prootic, 29, 30 — trunk vertebrae. 31 — dentary of new albanerpetontid amphibian, Coniacian, Dzharakhuduk. 32 — dentary of *Nukusurus insuetus* NESSOV, Lower Cenomanian, Sheichdzheili. 33 — dentary (holotype) of *Nukusurus insuetus* NESSOV, Cenomanian-?Lower Turonian, Tçelpyk Hill. Views: 12a, 20a, 26, 30b — anterior; 8a, 13, 14, 29b — posterior; 15—17, 20b, 21, 30a — lateral; 1a, 2b, 3—5, 12b, 27, 29a — dorsal; 1b, 2a, 18, 19a, 22b, 33a — ventral; 6, 7, 8b, 9—11, 19b, 22a, 23—25, 28, 31, 32, 33b — internal. Magnifications: 11, 18, 19 — ×3; 4, 29, 30 — ×4; 2, 3, 9, 1—15, 17, 28 — ×5; 1, 5—8, 10, 12, 16, 21, 23—27 — ×6; 22; 31—33 — ×8; 20 — ×10


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L. Nessov

Plate XV

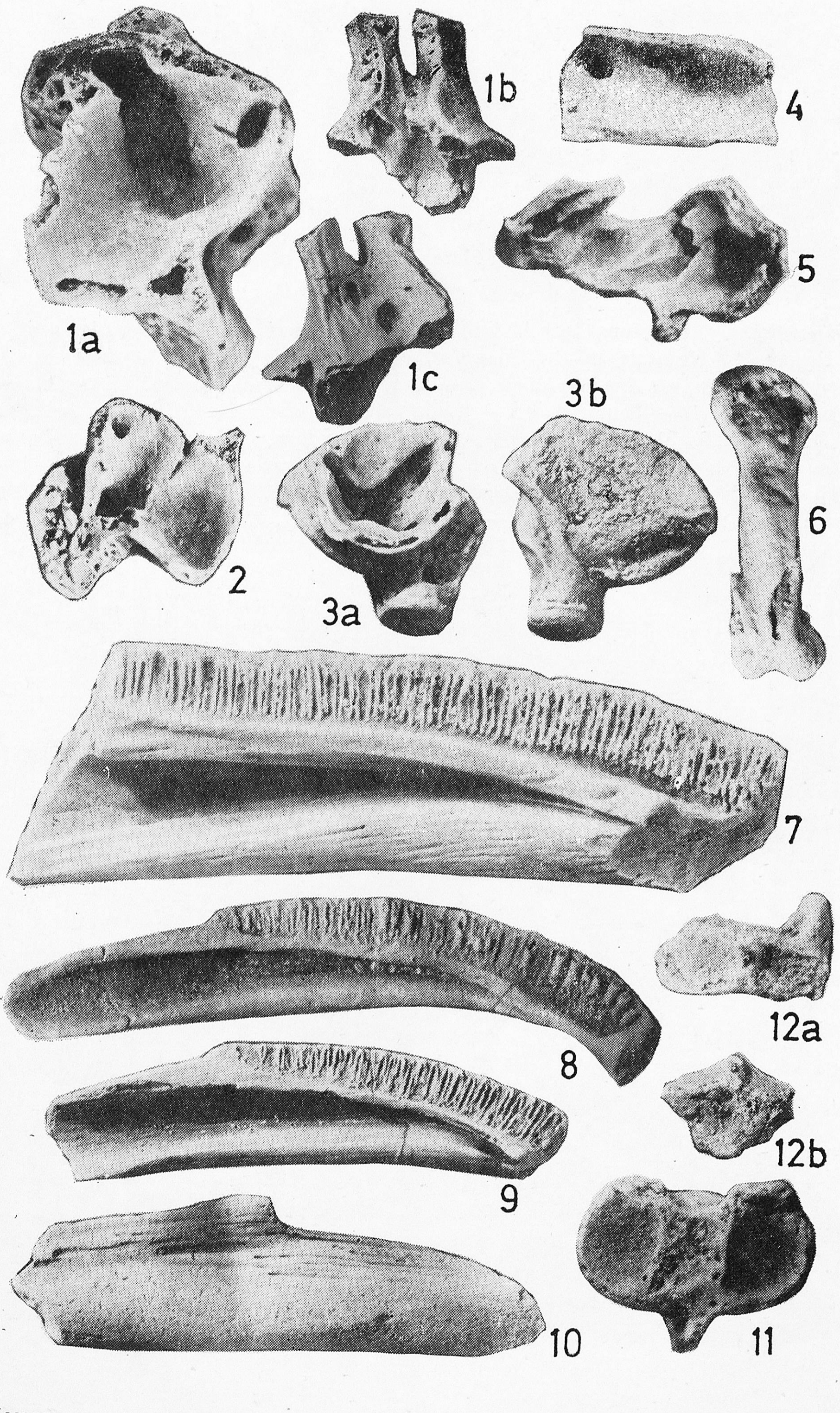
Bones of Late Cretaceous (Late Turonian and Coniacian) salamanders. 1, 2, 4—27 — *Eoscapherpeton asiaticum* Nessov; 3 — *Eoscapherpeton* sp. A. 1—4 — atlases, 5, 6 — vomers, 7, 8 — premaxillae, 9 — quadrate, 10, 11 — preoperculo-squamosals, 12 — scapulocoracoid, 13 — maxilla (holotype), 14 — dentary, 15 — angular, gonial and a fragment of dentary, 16 — gonial, 17 — angular, 18 — tibia, 19 — femur, 20—22 — parasphenoids, 23, 24 — parietals, 25 — frontal, 26 — trunk vertebra, 27 — caudal vertebra. 28 — fragmentary scale of actinopterygian fish. Dzharakhuduk, Upper Turonian — 13, 19, 26; Coniacian — remaining fossils. Views: 1a, 2, 3, 9, 26 — anterior; 4, 18, 19 — posterior; 1b, 12, 27, 28 — lateral; 7, 8, 10, 14, 20a, 22, 25 — dorsal; 5, 11, 13, 20b, 21, 23, 24 — ventral; 6, 15—17 — internal. Magnifications: 15 — ×2; 3, 11—14, 20, 21 — ×3; 1, 10, 17, 23, 24, 27 — ×4; 5, 9, 18, 22, 26 — ×5; 2, 4, 6—8, 16, 19, 25 — ×6


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*L. Nessov*

Plate XVI

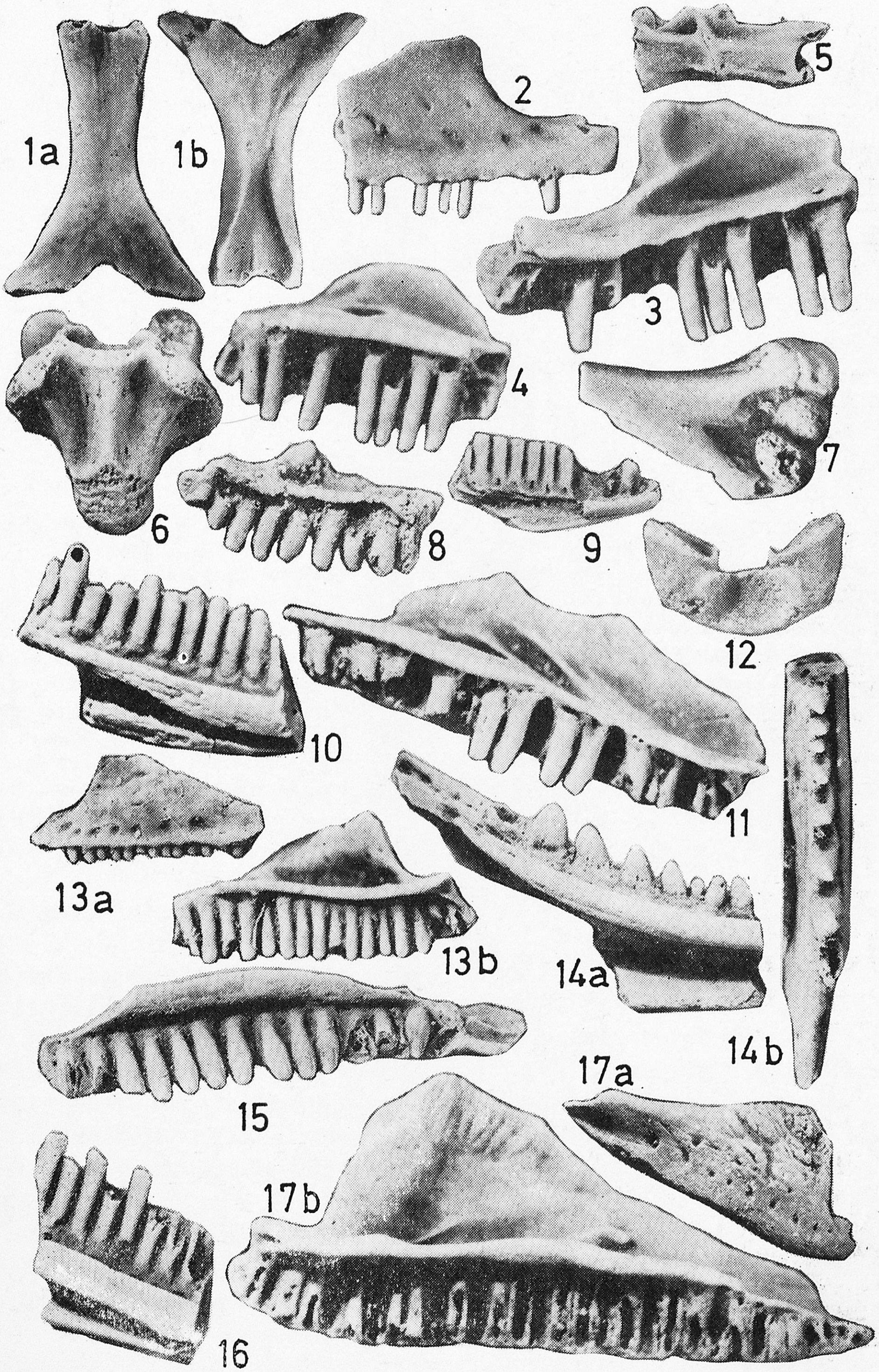
Remains of salamanders of Late Cretaceous (Late Turonian, Coniacian, Early Santonian, Santonian-?Campanian). 1—4, 7—10 — *Eoscapherpeton asiaticum* NESSOV: 1, 2 — prooticum, 3 — exoccipital, 4 — orbitosphenoid, 7—10 — dentaries; 5 — undeterminate salamander, knitted ossifications of exoccipital and prootic zones; 6 — ?*Mynbulakia* sp., preoperculo-squamosal and quadrate. Dzharakhuduk, Upper Turonian — 8—10; Coniacian — 1—7. 11 — atlas of *Eoscapherpeton* sp. B, Kansay, Lower Santonian; 12 — atlas of ?*Prosirenidae*, Baybishe, Santonian-?Campanian. Views: 11, 12a — anterior; 1a, 2, 6 — posterior; 1b, 10 — lateral; 3b — dorsal; 3a, 12b — ventral; 1c, 4, 5, 7—9 — internal. Magnifications: 1b, 1c, 2 — ×3; 7 — ×4; 1a, 3—5, 8—10 — ×5; 11 — ×6; 6, 12b — ×8; 12a — ×10




*L. Nessov*

## Plate XVII

Remnants of Early Cretaceous (Late Albian) and Late Cretaceous (Early Senomanian and Coniacian) lizards. 1 — frontals, 2—4 — maxillae, 5 — caudal vertebra with autotomy septa, 6 — trunk vertebra, cf. *Simoliopheidae*, 7 — humerus, Chodzhakul Lake, Upper Albian, 8, 11 — maxillae, 9, 10 — dentaries, 12 — trunk vertebra, Sheichdzheili, Lower Senomanian, 13, 15, 17 — maxillae, 14, 16 — dentaries, *Agamidae* (new form of *Priscagaminae*) and of undetermined lizard, Coniacian, Dzharakhuduk. Views: 7, 12 — anterior; 2, 5, 13a, 17a — lateral; 1a, 14b — dorsal; 1b, 6 — ventral; 3, 4, 8—11, 13b, 14a, 15, 16, 17b — internal. Magnifications: 12 — ×2; 6, 17a — ×3; 1 — ×4; 2, 5, 7—9, 11, 13a, 16, 17b — ×6; 3, 4, 10, 13b, 14, 15 — ×8




*L. Nessov*